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FEATURE

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THE RIGHT PUMP AT THE RIGHT PRICE

by ROWAN SHIRKIE

Clean safe water is an essential, unquestionable need. Yet fewer than 40 percent of the people in developing countries have access to it. The first consequence of this lack is disease. The second is the additional burden of hardship it means for the people who must somehow get water every day of their lives from whatever source is available.

Water for all -- reasonable access to safe water for every person on earth by 1990 -- is the goal of the International Drinking Water Supply and Sanitation Decade. The goal itself is only reasonable, yet the way to it seems intimidating. Progress can begin as simply as providing wells where they are most needed: groundwater, which requires little or no treatment to make it safe, is preferable to surface water -- but it requires pumps to draw it. Massive multimillion dollar schemes have been undertaken to do just that. But to the dismay of engineers, and the bitter disappointment of villagers in developing countries, water projects fail. At one time in the past five years, it was estimated that there were 32 million out-of-order handpumps in India alone, about 80 percent of the total installed.

Handpump technology has changed little in the past 2000 years. The most commonly used type for community water supply is a piston pump, in which a piston moving up and down inside a cylinder creates a partial vacuum, and atmospheric pressure on the groundwater outside the pump cylinder pushes water up through the pump. The principle is the same as drinking water through a straw.

International assistance programmes for rural water supplies created a new demand for rugged, low-cost pumps designed for simple troublefree operation and maintenance by local technicians. Experience taught some hard lessons: handpumps as they existed were not adapted to use in developing country villages, where they might be in use continually for up to 18 hours a day, worked by many different hands at

different rates -- and never get a drop of oil or tightened nut.

In many countries the most common cause of pump breakdown was wear of the seals that prevent water already raised from slipping between the piston and the cylinder walls during pumping. Success with an improved seal made from polyvinyl chloride (PVC) plastic led to investigations of the other uses this material might have for pumps.

At Waterloo University in Canada, a group of scientists sponsored by the International Development Research Centre (IDRC) produced a novel design that simplified the pumps mechanically, and substituted plastic pipe and moulded or milled plastic components for the traditional cast iron or steel. The result is a light-weight but hardy pump that is easy to transport and install, requires minimal upkeep -- and is inexpensive. Because many developing countries already produce PVC pipe for domestic use, the cost is reduced substantially.

A second important failing of traditional pumps -- breakage of the handles and their fulcrums from the stresses put on them by hard use -- was solved by eliminating the lever handle in favour of a crosspiece grip like a handlebar attached directly to the pump rod. Pumping is simply a straight up-and-down lifting and pushing motion. It seems well adapted to developing countries, where women will pump with a vigorous motion like pounding grain in a mortar, and small children will grab either side of the handlebar and jump up and down helping one another. In Bangladesh, a shallow well adaptation has the pump inclined so that water can be lifted with a rowing stroke.

Although it coped with many of the problems plaguing older designs, the PVC pump had to prove all its promise in actual use before engineers or villagers, wary of the latest technological fix, would accept it. IDRC embarked on an intensive global trials of the PVC pump, involving laboratory and field studies in Canada, England, Malaysia, Ethiopia, Bangladesh, Sri Lanka, Thailand, and Malawi.

More than a million people in the Central Highlands of Malawi get their water from unprotected waterholes near lowlying dambos, where surface water collects from rain runoff. Cholera has been a severe problem, prompting Malawian health officials to give a high priority to securing water supplies from contamination.

Malawi has been developing and testing pumps for its community protected wells programme for four years. Tom Nkana, the programme's project manager, says "It's quite a different thing to test a pump in Waterloo, Canada, and to use it every day here in Malawi. One of our problems has been with hyenas chewing the tee fittings and spigots from our pumps. The white PVC we use looks like bone -- a favourite with them. You can't really plan for that."

But it is obvious that the villagers take great pride in their wells and in

their ability to maintain them. The pumps have not betrayed the effort they invested in building the wells and learning new ways of using water. They can trust the pumps to work, and if something should go wrong, it is not too difficult to set right again quickly.

The PVC pump has caught on in Malawi. The Malawians have 500 experimental pumps. They are waiting for the research results to be incorporated into a final set of specifications, and then plan to manufacture and install the best version in the thousands.

It's hard to believe that there is any water to be found, let alone pumped, in the Danakil Desert in the east of Ethiopia. But an attempt to settle nomadic Afar here involves establishing health posts and community services -- including water. At Kebana, a remote settlement on the edge of the Danakil, a team from the Ethiopian Water Resources Authority (EWRA) emerges from the cloud of powdery dust stirred up by their equipment truck to begin the installation of a PVC pump.

The well site has been prepared in advance by another EWRA team, and a pyramid-like raised concrete platform poured with bolts for the pump stand cast into it. The average time for the 3-man EWRA crew on an installation of this sort is two hours. The cost is just slightly over $US50. Installed.

Sometime later, the crew goes looking for the first pump the project had installed when it got underway a year before. It has been almost that long since the site has been visited -- rains make the trails impassable, vegetation growth makes them nearly invisible. The fenced-in pump enclosure appears out of a clearing that marks the beginning of a maize field. There is no one in sight. It looks abandoned. But the pump pours forth a stream of water almost immediately after the engineer lifts the handlebar. "It works!" They seem genuinely surprised, but it does, after all, run counter to most of their experiences with pumps.

Later, when two women come to fill large clay pots used for carrying water, it is learned that about 100 people regularly draw their water at this well, coming once in the morning and once in the evening.

The PVC pump is not the ultimate solution to rural water supply in developing countries. But it can start safe water programmes flowing, and keep them going at a reasonable cost. Linked with other strategies, it may just be possible to provide water for all in the coming decades.

END

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